

**WHAT IS CLAIMED IS:**

1. A control apparatus for an automatic transmission, which executes a shift by simultaneously controlling release and application of different friction engaging elements, the control apparatus comprising:

a controller which i) controls a clamping force of a friction engaging element to be released and a clamping force of a friction engaging element to be applied, ii) adjusts an output torque of a prime mover for driving a vehicle, iii) detects a predetermined timing that is after the start of a torque phase during a shift of the automatic transmission and before the clamping force of the friction engaging element to be applied increases to the point at which torque input to the automatic transmission can be transmitted by only the friction engaging element to be applied, and iv) outputs a command to gradually reduce the clamping force of the friction engaging element to be released and a command to gradually increase the clamping force of the friction engaging element to be applied, in the torque phase,

wherein the controller outputs a command to reduce the torque of the prime mover for driving the vehicle in response to detection of the predetermined timing, and outputs a command to make the clamping force of the friction engaging element to be released 0 in response to detection of the predetermined timing.

2. The control apparatus according to claim 1, wherein the controller outputs a command to maintain the clamping force of the friction engaging element to be applied at the predetermined timing in response to detection of the predetermined timing.

3. The control apparatus according to claim 2, wherein the controller detects, as the predetermined timing, a timing at which the clamping force of the friction engaging element to be applied is a clamping force that is less than a preset clamping force by a predetermined amount.

4. The control apparatus according to claim 3, wherein the preset clamping force is the clamping force when the inertia phase starts.

5. The control apparatus according to claim 1, wherein the controller detects, as the predetermined timing, a timing at which the clamping force of the friction engaging element to be applied is a clamping force that is less than a preset clamping force by a predetermined amount.

6. The control apparatus according to claim 6, wherein the preset clamping force is the clamping force when the inertia phase starts.

7. A control apparatus for an automatic transmission, which executes a shift by simultaneously controlling release and application of different friction engaging elements, the control apparatus comprising:

controlling means for controlling a clamping force of a friction engaging element to be released and a clamping force of a friction engaging element to be applied;

adjusting means for adjusting an output torque of a prime mover for driving a vehicle;

detecting means for detecting a predetermined timing that is after the start of a torque phase during a shift of the automatic transmission and before the clamping force of the friction engaging element to be applied increases to the point at which torque input to the automatic transmission can be transmitted by only the friction engaging element to be applied; and

instructing means for outputting commands to the controlling means and the adjusting means, the instructing means comprising:

means for outputting a command to gradually reduce the clamping force of the friction engaging element to be released and a command to gradually increase the clamping force of the friction engaging element to be applied, in the torque phase;

means for outputting to the adjusting means a command to reduce the torque of the prime mover for driving the vehicle in response to detection of the predetermined timing by the detecting means; and

means for outputting a command to the controlling means to make the clamping force of the friction engaging element to be released 0 in response to detection of the predetermined timing by the detecting means.

8. The control apparatus according to claim 7, wherein the instructing means further comprises means for outputting a command to the controlling means to maintain the clamping force of the friction engaging element to be applied at the predetermined timing in response to detection of the predetermined timing by the detecting means.

9. The control apparatus according to claim 8, wherein the detecting means includes means for detecting, as the predetermined timing, a timing at which the clamping force of the friction engaging element to be applied is a clamping force that is less than a preset clamping force by a predetermined amount.

10. The control apparatus according to claim 9, wherein the preset clamping force is the clamping force when the inertia phase starts.

11. The control apparatus according to claim 7, wherein the detecting means includes means for detecting, as the predetermined timing, a timing at which the clamping force of the friction engaging element to be applied is a clamping force that is less than a preset clamping force by a predetermined amount.

12. The control apparatus according to claim 11, wherein the preset clamping force is the clamping force when the inertia phase starts.

13. A control method for an automatic transmission by which a shift is executed by

simultaneously controlling release and application of different friction engaging elements, the control method comprising the steps of:

controlling a clamping force of a friction engaging element to be released and the clamping force of a friction engaging element to be applied;

adjusting an output torque of a prime mover for driving a vehicle;

detecting a predetermined timing that is after the start of a torque phase during a shift of the automatic transmission and before the clamping force of the friction engaging element to be applied increases to the point at which torque input to the automatic transmission can be transmitted by only the friction engaging element to be applied;

outputting a command to gradually reduce the clamping force of the friction engaging element to be released and a command to gradually increase the clamping force of the friction engaging element to be applied, in the torque phase;

outputting a command to reduce the torque of the prime mover for driving the vehicle in response to detection of the predetermined timing; and

outputting a command to make the clamping force of the friction engaging element to be released 0 in response to detection of the predetermined timing.

14. The control method according to claim 13, further comprising the step of:

outputting a command to the controlling means to maintain the clamping force of the friction engaging element to be applied at the predetermined timing in response to detection of the predetermined timing by the detecting means.

15. The control method according to claim 14, further comprising the step of:

detecting, as the predetermined timing, a timing at which the clamping force of the friction engaging element to be applied is a clamping force that is less than a preset clamping force by a predetermined amount.

16. The control method according to claim 15, wherein the preset clamping force is the clamping force when the inertia phase starts.

17. The control method according to claim 13, wherein a timing at which the clamping force of the friction engaging element to be applied is a clamping force that is less than a preset clamping force by a predetermined amount is detected as the predetermined timing.

18. The control method according to claim 17, wherein the preset clamping force is the clamping force when the inertia phase starts.